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CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

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COUNTRY USSR (Leningrad Oblast)

REPORT

SUBJECT Svetlana Radio Tube Factory,
Leningrad

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THE SOURCE EVALUATIONS IN THIS REPORT ARE DEFINITIVE.
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(FOR KEY SEE REVERSE)

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1. Postulated development of a rectifier and listing of tube data

a.

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"In the discussion between Stakhovskiy¹ and Wiedemann these two questions were raised:-

- 1) Development and construction of a six-phase rectifier for N * 3,000 kw, which can be regulated from 9 - 18 kv, with the use of thyratrons.
- 2) Listing, for calculation, of constructional tube data like cathode, grid, and anode measurements.

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this task is a part of the task already received - for the production of a water-cooled 1,000-kw high-power tube...

can report on the various problems, while on development work, in the form of short reports. immediate application to this extensive task will take too far from main task - the installation of a development center...."

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- b. Comment. These tasks were not in fact carried out. The Germans believed that they were posed merely to give them some occupation. Large rectifiers were later made by other sections of the factory.

2. Development of a 300-kw short wave transmitter tube and other work

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STATE	x	ARMY	x	NAVY	x	AIR	x	FBI		AEC		OSI	x		
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25 YEAR RE-REVIEW

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1) Tube RS 300

The sample tube and drawings given [] are only of limited use for the necessary RS 300, as they apply to the similarly constructed RS 301. To obtain the necessary data for RS 300, the dismantling of the RS 301 was begun. This work has already suffered delays as almost all the tools and help [] have been lacking."

(Precis) To proceed with the work of developing RS 300, proper drawing material and a knowledge of Svetlana's production capabilities are needed.

2) Test transmitter for RS 300

In the discussion mentioned in the introduction, the construction of a test transmitter for the RS 300 was set as a new task.

This transmitter is to work on c. 14 m. As this very much more difficult limiting wave length condition would necessitate alterations of tube design, as compared with the RS 300... [] altering the wave length of the test transmitter to 400 or, better, 1200 m.

The testing of the effective power demanded at a limiting wave length of 14 m would then have to be done in another.... simpler short wave transmitter.

For the construction of such a transmitter [] however, dependent on the cooperation of Dr. Buschbeck, who is also in the USSR.

The long wave transmitter of about 400 or 1200 m would have to work with four to six amplifier stages. This problem needs further consideration and discussion.

The beginning of the planning of the long wave transmitter would be in January and February.

3) Tube development center

[] must begin in the next two months with [] main task, the building of ... a tube development center, in order to be able to solve the above extensive tasks. In this connection it would be important to see beforehand the apparatus and machines brought over from AEG to consider the possibility of their use in the tube development center.

4) Miscellaneous work done

Since starting work on 27 December 1946, work on the following, as well as the above-mentioned tasks, has been done: the German technical library of the department has been inspected, arranged, and catalogued; aid and advice have been given to other works departments in the fields of glass and pulse techniques.

For Messrs. "Überrück, Oberländer
Wiedemann and Drs. Zinke and Kotowski..

(Signed) Dr. Gross. "

- 1) This was the first important task received by the Germans from the Soviets. A short wave 300-kw water-cooled transmitter tube had to be developed. The prescribed working frequency was 22 mcs. A looted Siemens tube was produced by the Soviets as a sample.

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- 2) The first attempts to construct this tube failed because of these shortages:

The tantalum tube needed for the cathode could not be procured.

Quartz supports for fastening the grid construction were similarly lacking.

In RS-300 the water coolant should be led to the cathode via a tombac corrugated pipe that would have the property of compensating cathode expansion. ("... ein Wellrohr aus Tombac..."). Such a pipe could not be made available in Leningrad.

- 3) The Germans then designed a tube to obviate the difficulty of these shortages. This at first retained the type reference RS 300. The sample of this new tube had a constructed height of 90 cm, as opposed to Siemens' 180 cm. The development work on this tube ran parallel to the work on the 10 mw Taströhre and was finished by the end of 1948.
- 4) The finished tube received the type number G 1250 (or GI250). About 20 of these tubes had been built by December 1950 and about half of these fulfilled the required specifications. These were all sent to Moscow and the test results came back, in writing, to Svetlana.
- 5) Svetlana made much propaganda use of this tube; the Germans Oberländer, Zinke, and Wiedemann received written acknowledgements; the Soviet Galina Mikhaylovna Moskovskaya spoke on the radio about this tube; a gilded cross-section was sent by hand of three couriers as a present to Stalin on his 70th birthday (December 1949); and there was an article on the tube in the plant newspaper "Svetlana" of 14 June 1948:-

c.

"Work With a Will Leads to Progress"

Production of a new power tube.

"Up to now, the very greatest power of an unsoldered (? - Otpayanny) transmitter tube has been 100 kw, adapted to the power of Soviet Union broadcasting stations.... A group of engineers of our factory has accomplished the preparation of a 250 kw short wave unsoldered transmitter tube. The group was under the direction of the Chief Designer of the works, S. I. Rudkovskiy,² and consisted also of the Laboratory Head, Z. M. Lifshits, and of the immediate worker on the task, G. M. Moskovskaya.

The work was started at the end of 1947 and the first 250 kw tube in the Soviet Union was already produced in May 1948...

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- d. Technical description of the tube (250-kw short wave unsoldered transmitter tube) (See sketch of tube on page 8.)

- 1) The cathode was self-supporting in construction so that quartz and tombac became unnecessary. The tube was directly heated with three-phase alternating current. The cathode was made of tungsten wire and was water-cooled. The water flowed through a central inner 10-mm-diameter tubing and flowed out through an outer 200-mm-diameter tubing, which was coaxially reversed over the inner tubing. The cathode diameter was 80 mm. The tungsten wire had a diameter of 1.3 mm. The three phases were connected through three concentric rings and eight needle-shaped cathodes 400-mm in length were connected to each phase.

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- 2) The grid had a diameter of 88 mm and was wound on a frame of molybdenum rods. These eight rods were wound with thin molybdenum wire (0.25 mm in diameter), the latter serving to secure the grid wire. The grid wire itself consisted of molybdenum wire (0.3 mm in diameter) and was wound up to a height of 90 mm with a pitch of 2.5 mm.
 - 3) The anode had an inside diameter of 130 mm. Special construction of the cooling vessel made water cooling of the external copper anode possible. The outside diameter of the anode was 142 mm. Rings of 140 mm diameter were turned to obtain the necessary whirling motion of the water. The metal-to-glass seal was made with Kovar. The glass envelope had a diameter of 164 mm. The anode was connected with the help of a clamp at the top of the cooling vessel. The grid was connected below to a ring, which also had a clamp with a water-cooled rosette-shaped contact. The pump stub was at one side below the anode. There were six contacts for the heater connection, each having a diameter of 13 mm.
 - 4) This tube usually was used in the vertical position with the heater pins pointing up. The flange for the grid connection can be seen below the heater connections. This Kovar flange worked by means of a rosette which made contact along the entire groove. The last glass-to-metal seal for assembly of the tube was made at this point. The copper ring which lies below the glass envelope serves as the anode connection as well as a seal for the cooling vessel (not shown in diagram).
 - 5) At the same level on the inside, around the cooling tubing for the cathode, a double plate made of copper is designed to prevent radiation of the cathode upwards. A thin glass or ceramic disc above the double plate serves to hold the cathode in position. Below the double plate, at a height of about $\frac{2}{3}$ and $\frac{1}{3}$ of the cathode, two tantalum rings can be seen. Three of them for each phase serve as getters and as cathode supports. They are 0.5 mm thick. At the lower end of the middle cooling tubing, there is one more tantalum disc which bridges all three phases at this point. The cooling tubing itself ends in a tapering cone which fits into a space 8 mm in diameter cut in the quartz. The quartz is surrounded by a coil of tungsten-molybdenum wire which serves to secure the grid rods.
- e. Comment: the test transmitter (part 2) in Document VI above).
- 1) This transmitter was not built by the Germans in Svetlana. Tubes were sent to Moscow, where there was apparently a test transmitter, as well as a long wave test transmitter. The test results, communicated orally to the Germans, showed that several examples gave up to 300 kw power and that the limiting wave length sank to 10 m.
 - 2) The cooperation of Dr. Buschbeck was never realized.

f. Comment: tube development center.

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This was installed in building No. 6 (see plan of Svetlana works). A space of about 12 x 18 m was fitted up on the ground floor. It was known to the Soviets as the MGL laboratory (= Moshchnaya Generatornaya Lampa). As this place was only fully set up in mid-1949, Shop 3 (building 10 on plan) was also used up to then for experimental work.³

g. Comment: miscellaneous work done

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The technical library mentioned above was a very mixed one, containing some books on subjects outside the field of Svetlana's interests. The library had been brought as loot from Vienna.

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1) Tantalum tubing

What are the maximum dimensions - length and diameter - of seamless drawn tantalum tubing that can be produced in the factory?

Production is not possible in Svetlana. Such tubes must be procured from other factories. (Precis:) [] asked if seam-welded tubes could be used; there was no final answer to this; more experiments must be undertaken.

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2) Kupferschneidenanglasungen (sic)

What maximum diameters in Kupferschneidenanglasungen have been produced up to now?

Up to 96 mm. [] such Anglasungen (sic) up to 120 mm possible. []

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Comments: 1) Even seam-welded tantalum tube was not made available.

2) The Kupferschneidenanglasung (sic) process had been previously used at Svetlana. The Kovarstumpfanglasung (sic) process was first introduced by the German scientists and brought to the Soviet personnel.

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4) Gvozdev was never introduced to the Germans.

3. Development of a 1 mw tube

a. In spring 1950, the Soviets set the Germans the task of constructing a tube rather similar to that described in paragraph 2 of this report - the GI 250 (or G 1250 ?). It had, however, to give 1 mw power at the same frequency.

b. Essential data

The sample 1 mw tube designed in 1950 had the same height as GI 250 but its diameter was considerably greater. The cathode had 36 instead of 24 filaments. Again, instead of the central water cooling of the GI 250, this 1 mw tube had a 6-mm-thick Mo rod at its center; this served for the fastening of a concentric tantalum cylinder of 80 mm diameter and 400 mm constructed length. The tantalum cylinder was made from a plate. It had two functions:- (a) it brought about a discharge of the cathode radiation on to the anode, through reflection, and (b) the getter action of the tantalum was used to improve the vacuum. Thus the water cooling could be discontinued in the center of the tube.

c. Production

In December 1950, the sample tube which the Germans had designed was being built in Svetlana.

4. Visit to Shop 3

a. []

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"1) Visit to Shop 3

[] the production processes for type G 433 in Shop 3..."

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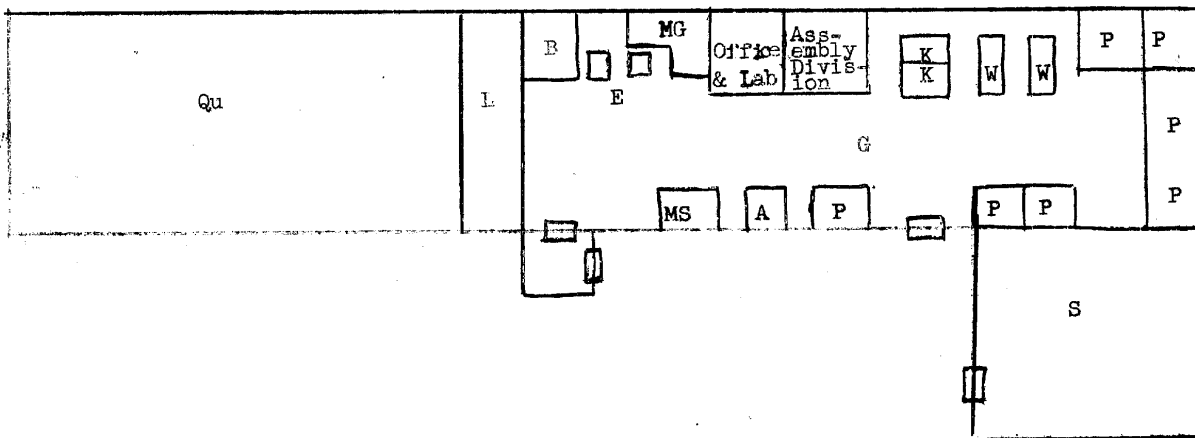
- b. Comments: 1) Tube type G 433 is a water-cooled 100-kw transmitter tube.
- 2) See sketch below for layout of Shop 3.
- 3) At the time many air-cooled transmitter tubes with radiators of 300-mm diameter and 400-mm height were also produced here. These radiators were in most cases fastened to the tubes with soft solder.

Svetlana Radio Tube Factory, Leningrad

Plan of Laboratory for large transmitter tubes - Shop 3. Ground Floor

(= No. 10 on main plan of Svetlana)³

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Key to plan of Shop 3

- Qu = Quartz melting and polishing . . .
- G = Large transmitter tube development section.
- S = Welding shop
- L = Store
- B = Pickling plant (Beizerei)
- E = Rotating gas-fired melting-down machine
- MG = Assembly bench for glass-blowing
- K = Karburierstände (?) carburization stands
- W = Hydrogen ovens
- P = Pump stands
- A = "Atomic arc-welding installation"
- MS = Fitter mechanic's assembly bench.

Notes: (a) Between MG and K there were two rooms separated off by glass walls. One was an office and technical laboratory. The Germans sometimes worked here before they had their own laboratory. In the second room, 12 girls were employed on tube construction.

(b) There was an electrical workshop and an X-ray section on the second floor above Qu.

5. Shortages of drawing and technical apparatus and of needed data

a.

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.....2. (Precis). The Germans asked, not for the first time, for another

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drawing board, transparent paper, table lamps, drawing rulers, and such apparatus.

3. Procurement of data for the work of the group

- 1) Characteristics of the Ia/Ug fields of tubes G 433 and G 431, received in the Tastbetrieb (sic), were asked for.
- 2) Data for oscillating crystals were also requested.

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- b. Comments:
- 1) The supply of drawing material was very bad. The first drawing board had to be put together from scraps, and had no proper ruler for a long time. Transparent drawing paper was never supplied to the Germans. For a long time there were even no erasers.
 - 2) Data for the Soviet tubes G 433 and G 431 were supplied; data for the crystals were not. Uberruck and Gross were interested in these, as they were working on test transmitters. Uberruck had at first declined to do any work for the Soviets on the grounds that it had military applications; his protestations were without effect.
 - 3) Technical apparatus needed by the Germans for their laboratory could likewise not always be supplied by the Soviets; thus a pump stand had to be built by Felber, with electrical parts by Oberländer. A tube test bench also had to be built in the same way.

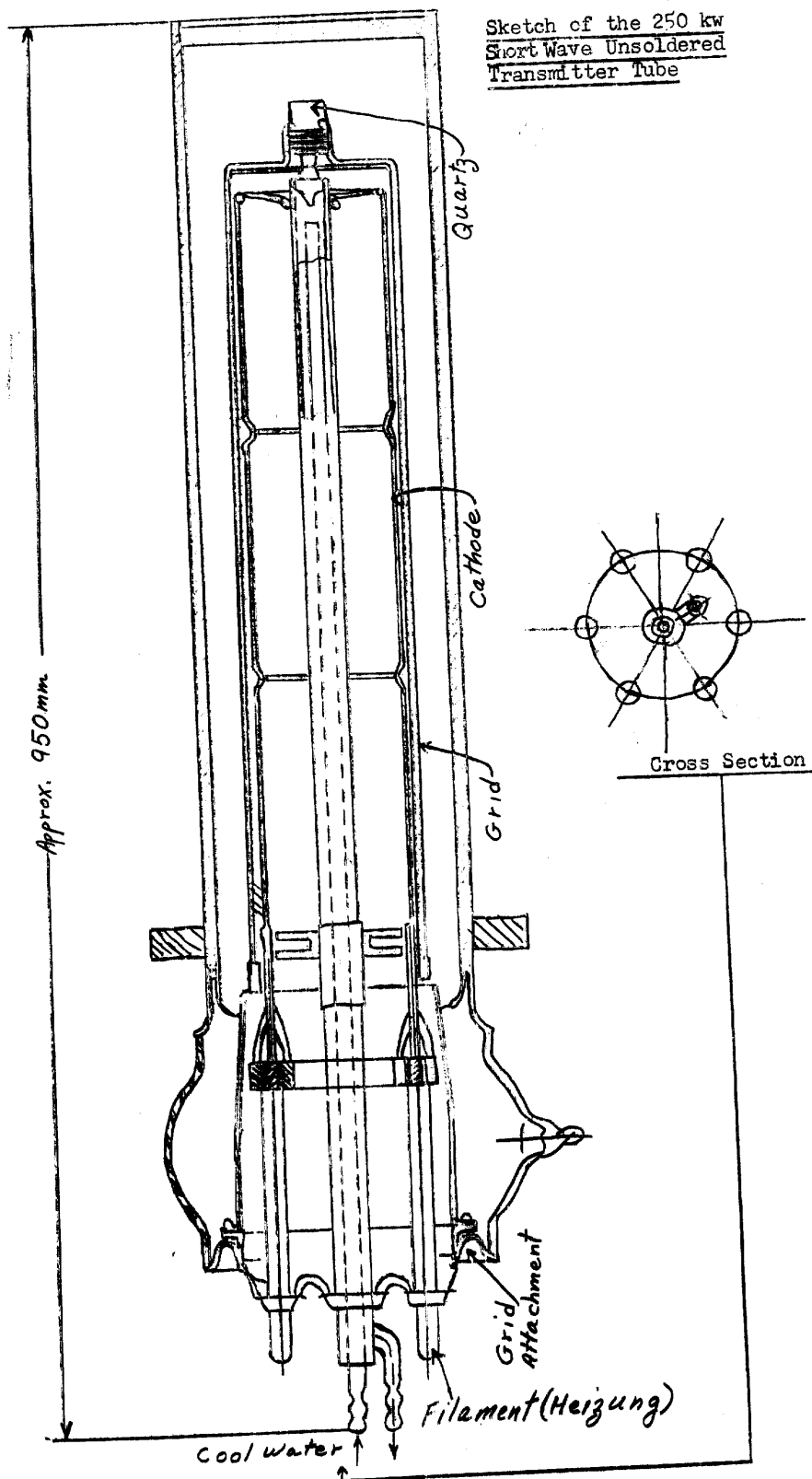
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